



**PATENT**

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1. (Currently Amended) A voltage-controlled tunable comb-ring type filter comprising:  
a first ring or combline resonator;  
a second ring or combline resonator coupled to said first ring or combline resonator;  
a third resonator coupled to said second ring or combline resonator and cross coupled to said first ring or combline resonator, wherein at least one of said resonators includes at least one voltage tunable dielectric capacitor and wherein the cross coupling is realized by a transmission line shorted on both ends of at least one of said first, second or third resonators or by placing a ring resonator in a different layer relative to a combline resonators or by keeping two comb line resonators straight and in proximity to a ring resonator.
2. (Original) The voltage-controlled tunable comb-ring type filter of claim 1, wherein said first resonator is a combline type resonator.
3. (Original) The voltage-controlled tunable comb-ring type filter of claim 1, wherein said second resonator is a ring type resonator.
4. (Original) The voltage-controlled tunable comb-ring type filter of claim 1, wherein said third resonator is a combline type resonator.
5. (Original) The voltage-controlled tunable comb-ring type filter of claim 1, further comprising an input transmission line connected with said first resonator.
6. (Original) The voltage-controlled tunable comb-ring type filter of claim 1, further comprising an output transmission line connected with said third resonator.
7. Cancel claim 7.

8. Cancel claim 8.
9. Cancel claim 9.
10. Cancel claim 10.
11. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 1, wherein each of said first, second and third resonators includes at least one ~~variable~~ voltage tunable dielectric capacitor.
12. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 10, further comprising biasing lines associated with said ~~variable~~ voltage tunable dielectric capacitor to provide bias to said ~~variable~~ voltage tunable dielectric capacitors.
13. (Original) The voltage-controlled tunable comb-ring type filter of claim 12, wherein said biasing lines include four resistors to block any RF leakage into said DC biasing lines.
14. (Original) The voltage-controlled tunable comb-ring type filter of claim 1, wherein any or all of said resonators can be implemented in a microstrip or stripline form.
15. (Original) The voltage-controlled tunable comb-ring type filter of claim 1, wherein any or all of said resonators can be bent towards each other to reduce the size of said filter.
16. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 1, wherein in ~~any or all of said resonators~~ at least one DC blocking capacitor ~~are~~ is used at the end

of said ~~any or all of said~~ first resonators, said second resonator or said third resonator in order to bias any or all of said resonators.

17. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 10, further comprising a ring resonator circuit with a DC blocking capacitor at the opposite end of said ~~variable~~ voltage tunable dielectric capacitor position in order to make the whole structure symmetric.

18. Cancel claim 18.

19. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 18, wherein said voltage tunable dielectric capacitor includes a substrate having a low dielectric constant with planar surfaces.

20. (Original) The voltage-controlled tunable comb-ring type filter of claim 19, further comprising a tunable dielectric film on said substrate made from a low loss tunable dielectric material.

21. (New) New for numbering purposes, but canceled.

22. Cancel claim 22.

23. (Original) The voltage-controlled tunable comb-ring type filter of claim 240, further comprising a low loss isolation material used to isolate an outer bias metallic contact and the metallic electrode on said tunable dielectric material.

24. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 10, wherein the center frequency of the filter is tuned by changing the ~~varactor~~ voltage tunable dielectric capacitor capacitance controlled by changing the voltage applied to said ~~varactor~~ voltage tunable dielectric capacitor.

25. Cancel claim 25.

26. Cancel claim 26.

27. Cancel claim 27.

28. Cancel claim 28.

29. (Currently Amended) A method of filtering signals using a voltage-controlled tunable comb-ring type filter comprising the steps of:  
providing a first ring or combline resonator;  
coupling a second ring or combline resonator to said first resonator;  
coupling a third resonator to said second resonator and cross coupling third resonator to said first resonator, wherein the cross coupling is realized by a transmission line shorted on both ends of at least one of said first, second or third resonators or by placing a ring resonator in a different layer relative to a combline resonators or by keeping two comb line resonators straight and in proximity to a ring resonator.

30. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, wherein said first resonator is a combline type resonator.

31. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, wherein said second resonator is a ring type resonator.
32. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, wherein said third resonator is a combline type resonator.
33. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, further comprising an input transmission line connected with said first resonator.
34. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, further comprising the step of providing an output transmission line connected with said third resonator.
35. Cancel claim 35.
36. Cancel claim 36.
37. Cancel claim 37.
38. Cancel Claim 38.
39. (Currently Amended) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, wherein each of said first, second and third resonators includes at least one ~~variable~~ voltage tunable dielectric capacitor.

40. (Currently Amended) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, further comprising the step of providing bias to said ~~variable~~ voltage tunable dielectric capacitors by providing biasing lines associated with said ~~variable~~ voltage tunable dielectric capacitor.

41. ((Currently Amended)) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim ~~29~~40, wherein said biasing lines include four resistors to block any RF leakage into said DC biasing lines.

42. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, wherein any or all of said resonators can be implemented in a microstrip or stripline form.

43. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, wherein any or all of said resonators can be bent towards each other to reduce the size of said filter.

44. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, wherein in ~~any or all of said resonators~~ at least one DC blocking capacitor ~~are~~ is used at the end of said ~~any or all of said~~ first resonators, said second resonator or said third resonator in order to bias any or all of said resonators.

45. (Currently Amended) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim ~~38~~28, further comprising the step of providing a ring resonator circuit with a DC blocking capacitor at the opposite end of said ~~variable~~ voltage tunable dielectric capacitor position in order to make the whole structure symmetric.

46. Cancel claim 46.

47. (Currently Amended) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 46, wherein said voltage tunable dielectric capacitor includes a substrate having a low dielectric constant with planar surfaces.

48. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 47, further comprising the step of providing a tunable dielectric film on said substrate made from a low loss tunable dielectric material.

49. (Original) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 29, further comprising a metallic electrode with predetermined length, width, and gap distance associated with at least one resonator.

50. Cancel claim 50.

51. (Currently Amended) The method of filtering signals using a voltage-controlled tunable comb-ring type filter of claim 38, wherein the center frequency of the filter is tuned by changing the ~~varactor~~ voltage tunable dielectric capacitor's capacitance controlled by changing the voltage applied to said ~~varactor~~ variable voltage tunable dielectric capacitor.

52. Cancel claim 52.

53. Cancel claim 53.

54. Cancel claim 54,



55. Cancel claim 55.

56. (Currently Amended) A voltage-controlled tunable comb-ring type filter comprising:  
a plurality of resonators, said plurality of resonators comprising:  
a first of at least two combline type resonators;  
a first of at least one ring type resonator coupled to said first of at least two combline type resonator;

a second of said at least two combline type resonator coupled to said first of at least one ring type resonator and cross coupled to said first of at least two combline type resonators,  
wherein the cross coupling is realized by a transmission line shorted on both ends of at least one of said first, second or third resonators or by placing a ring resonator in a different layer relative to a combline resonators or by keeping two comb line resonators straight and in proximity to a ring resonator.

at least one of said plurality of resonators includes at least one ~~variable~~ voltage tunable dielectric capacitor;

an input transmission line connected with at least one of said plurality of resonators;

an output transmission line connected with at least one of said resonators[;].

57. Cancel claim 57.

58. Cancel claim 58.

59. Cancel claim 59.

60. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 57, further comprising biasing lines associated with said ~~variable~~ voltage tunable dielectric capacitor to provide bias to said ~~variable~~ voltage tunable dielectric capacitors.

61. (Original) The voltage-controlled tunable comb-ring type filter of claim 60, wherein said biasing lines include four resistors to block any RF leakage into said DC biasing lines.

62. (Original) The voltage-controlled tunable comb-ring type filter of claim 57, wherein any or all of said resonators can be implemented in a microstrip or stripline form.

63. (Original) The voltage-controlled tunable comb-ring type filter of claim 57, wherein any or all of said resonators can be bent towards each other to reduce the size of said filter.

64. (Original) The voltage-controlled tunable comb-ring type filter of claim 57, wherein ~~in any or all of said resonators~~ at least one DC blocking capacitor ~~are~~ is used at the end of said ~~any or all of said~~ first resonators, said second resonator or said third resonator in order to bias any or all of said resonators.

65. (Currently Amended) The voltage-controlled tunable comb-ring type filter of claim 57, further comprising a ring resonator circuit with a DC blocking capacitor at the opposite end of said ~~variable~~ voltage tunable dielectric capacitor position in order to make the whole structure symmetric.

66. Cancel claim 66.